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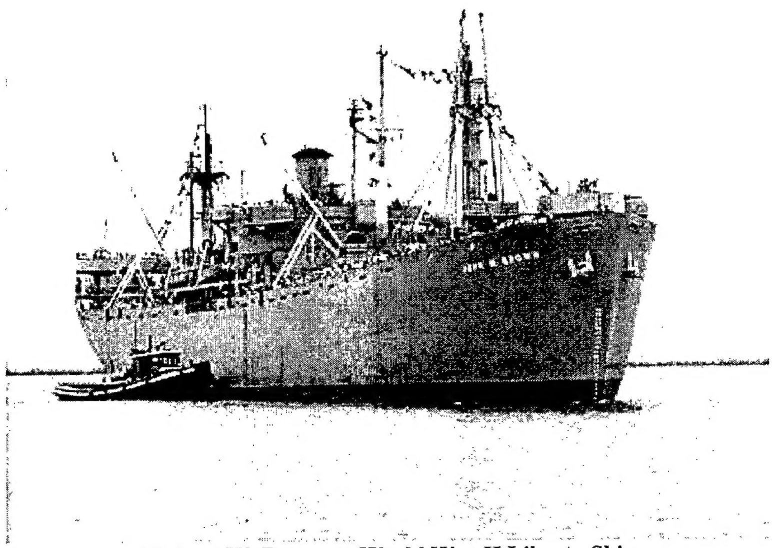
"A Lesson of Two World Wars: Protect the Ships, not the SLOCs"



SS John W. Brown, a World War II Liberty Ship

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This paper reflects my own personal views and they are not necessarily endorsed by the Naval War College or the Department of the Navy.

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Protection of the United States' vital, irreplaceable sealift assets and/or merchant shipping in time of hostilities presents a formidable challenge for a theater commander, especially when considering the threat posed by today's state-of-the-art diesel-electric submarines and the next generation of closed-cycle, air-independent propulsion submarines that are now, or soon will be, in the hands of the United States' potential adversaries. The enduring lesson of both World Wars was that it took time for the Allies to realize that technology was not the anti-submarine panacea it had been hoped to be, and it was the age-old practice of escorted convoys that provided the only real security for the merchant ships that supplied the war effort. This lesson remains relevant today, at a time when the United States military is more reliant than ever on sealift. This paper describes a number of operational and logistics challenges associated with implementing a convoy system today and offers some possible solutions.

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The Desert Storm experience reaffirmed that when the United States goes to war, at least 85% of its war material will move by sea.[1] Moreover, a considerable fraction of the nation's first offensive punch is always at sea, in the form of pre-positioned military material aboard converted merchant vessels. Protection of this vital, irreplaceable shipping in time of hostilities presents a formidable challenge for a theater commander, especially when considering the threat posed by today's state-of-the-art diesel-electric submarines and the next generation of closed-cycle, air-independent propulsion submarines that are now, or soon will be, in the hands of the United States' potential adversaries. With this challenge in mind, I will show that the lessons learned and the pitfalls experienced by the Allies in fighting the Atlantic ASW campaigns of the two World Wars are timeless and therefore useful today in developing an operational design for safeguarding our sealift.

German U-boats sank over 8000 merchant vessels (totaling more than 27 million gross registered tons) during the two World Wars, twice bringing the island nation of Great Britain to her knees. During World War II technological developments swayed the advantage from the U-boats to the defenders and back again. U-boats became faster, deeper diving, and better armed, countering advances in Allied sensor technology. In both wars it took time for the Allies to realize that technology was not the panacea it had been hoped to be, and it was the age-old practice of escorted convoys that provided the only real security for the merchant ships that supplied the war effort.

Since the days of sail, merchant vessels have sought the protective umbrella of friendly warships to shield them from pirates, privateers, and enemy warships. In the modern era, however, the convoy system is usually associated with World War I as the great strategic innovation that defeated the U-boats. Surprisingly, however, the first merchant convoy of the war didn't sail until January 1917, two years after Germany had

launched its U-boat campaign against merchant shipping. The British Admiralty, fully committed to a strategy of hunting and killing U-boats in the open ocean, felt that close convoy escort was a retreat to a purely defensive strategy and therefore a misuse of its high-tech warships. Convinced that newly-fielded ASW technology, such as the depth charge, would eventually defeat the U-boat menace, the Navy leadership clung to their belief that the attack was the best defense against U-boats. The British Parliament, outraged by the enormous losses in merchant shipping, eventually found it necessary to order the Navy to implement a convoy system. The Admiralty's response was to divide its warship assets between submarine hunting and convoy escort: of the 5018 British warships in commission in October 1918, only 257, or just over 5 percent, were allocated to convoy escort.[2] In spite of the half-hearted effort put forth by the Navy, the effect on merchant ship losses was profound. During the period November 1917-October 1918, there were a total of 48,861 independent merchant ship sailings; U-boats sank 1,497 for a loss rate of 3.06 percent. In contrast, during the period of February 1917 – October 1918, a total of 83,958 ships sailed in convoy; 260 were lost to U-boats, for a loss rate of .031 percent.[3]

The success of the convoy system was and still is rooted in the limited detection envelope of the submarine's onboard sensors compared to the vastness of the ocean. Given the submarine's limited height of eye, a convoy of ships is not much more likely to be sighted than a single ship. In average visual conditions, a submarine would probably see a single ship only if the ship's track brought it within ten miles of the submarine. By comparison, a convoy of twenty ships was normally only two miles wide and so would be seen by a submarine that is within eleven miles of the center of the track of the convoy. It follows that five convoys of twenty ships each were not very much more likely to be

sighted than were five single ships. Moreover, five twenty-ship convoys were much less likely to be seen than a hundred ships sailing independently. The result was that the vast majority of ships sailing in convoy were never seen. When viewed from the U-boats' perspective, the immediate effect of the convoy system was that the ocean suddenly seemed to be empty of shipping.[4]

When a U-boat did sight a convoy, the U-boat commander was faced with the difficult challenge of attaining a favorable position to deliver his weapons without exposing his presence to the escorting warships. Unless, by chance, the U-boat was very close to the convoy's track and well ahead of the convoy's beam at first sighting, the U-boat's low speed while submerged on battery propulsion made it extremely unlikely that the commander would be able to attain the preferred firing position (700 yards from the track) before the convoy got by. The U-boat skipper's only option at that point would be to continue the chase on the surface, using diesel propulsion for higher speed with which to maneuver into position ahead of the convoy, but thereby increasing the risk of being sighted and engaged by the convoy's escorts. By the end of World War I the appearance of airships and primitive aircraft as part of the ASW team rendered daylight surfaced operations untenable; hence, the idea of the nighttime surfaced attack was born.

If the convoy was the great operational innovation of World War I, then the wolf pack might be called the great operational innovation of World War II. The commander of the German U-bootewaffe, Admiral Karl Doenitz, had been a U-boat commander (and a prisoner of war) in 1918. He was thus painfully aware of the dangers involved when attacking convoys, given the limited mobility and sensor capability of the U-boat. His operational idea was to match the concentration of escorting warships around a convoy with a similar concentration of submarines, dubbed a wolf pack by the Allies. In keeping

with the lessons of World War I, the wolf pack would attack at night while surfaced, taking advantage of the U-boats' surfaced speed and their nearly invisible silhouettes to infiltrate the convoy. Doenitz realized that he needed an early victory, before the Allies could build enough escorts and devise countermeasures to defeat the wolf pack. Consequently, the few wolf packs he could muster at the beginning of the war would need to be accurately positioned on the track of oncoming convoys. With this in mind, it can be seen that the critical enabling element of the wolf pack strategy was the German cryptanalysts' success at deciphering Allied convoy routing signals. This vital breakthrough permitted Doenitz' headquarters to follow convoy movements in detail. Signals intelligence (SIGINT) thus became a crucial element of a submarine campaign.

The wolf pack strategy took the Allies by surprise. Their ASW doctrine did not address coordinated attacks by German submarines operating on the surface, where they were immune to detection by sonar, the pivotal ASW advance of the interwar period. The Allies were further crippled by the German invasion threat in 1940 that forced convoys to be stripped of escorting warships, since they were needed to defend the British homeland. This phase of the Battle of the Atlantic, called "the Happy Time" by U-boat men, could well have been decisive if Doenitz had had the 350+ U-boat fleet that was programmed for completion by 1944, the date the German Navy had been told to be ready for war. Fortunately for the Allies, the U-bootewaffe entered the war with only 57 operational boats, of which 37 were capable of blue water operations. By 1943, the ascendancy of Allied ASW countermeasures and the flood of new escort vessels being delivered by Allied shipyards would compel Doenitz to abandon the strategy of frontal assault by wolf packs against the then heavily-defended convoys. The failure of the strategy resulted from the German Navy betting everything on a quick, decisive victory by the wolf packs and

neglecting, until too late, to counter advancing Allied ASW technology by assigning sufficient priority to production of the high-speed Type XXI Electroboote and the Walter air-independent propulsion system.

The Allies soon discovered the critical vulnerabilities of the wolf pack strategy. Chief among them was the highly centralized command and control system conceived by Admiral Doenitz. Coordinating a massed attack by multiple submarines against a particular convoy required extensive communications, not only between Doenitz' headquarters and the boats at sea, but also between the individual boats of the wolf pack. Tactical communications by U-boats presented an opportunity for suitably-equipped escort vessels to pinpoint the source using high frequency radio direction finding or HF/DF. SIGINT quickly became as vital to the Allied ASW effort as it had already become to the German submarine campaign.

Remarkably, neither the Allies nor the Germans fully realized the extent to which their enemy was able to penetrate and exploit their secure communications until after the war. The penetration of the German Enigma cipher by the Allies has been credited by many as the breakthrough that led to the defeat of the U-boats. The information obtained by this means was certainly useful in anticipating U-boat movements, yet any advantage gained was often nullified by Doenitz' ability to read the resulting orders that rerouted convoys out of danger.

There are a number of operational lessons here. The first, and most important, is that the convoy with both air and surface escorts is the surest means of, not only protecting merchant ships, but also forcing decisive engagements between escorts and U-boats. As naval historian V. E. Tarrant points out, "the proof was in the eating of the pudding: between September 1943 and May 1945, out of the tens of thousands of ships escorted, U-

boats sank only 100 ships in convoy worldwide, but lost in return 150 U-boats to air and sea convoy escorts."[5] In facing the wolf packs, the convoy concept withstood a far more demanding test than could be presented by any enemy today, even considering technological advances in submarines.

A second lesson was that U-boats could be hunted down and killed with some success if, and only if, accurate, real-time cueing information was available. Although Ultra information (the Allies' code name for communications intelligence) was often received too late for tactical forces to immediately exploit, it often provided clues that could be pieced together with other information that might lead to an interception at a later date. The truly decisive SIGINT advance, however, was shipboard HF/DF fixing of U-boat transmissions. A real-time HF/DF fix enabled escorts to quickly locate U-boats that were shadowing a convoy at a distance and to either destroy them or force them to submerge. Even if it was not destroyed, aircraft and/or surface warships could hold a shadowing U-boat down where it was blinded and essentially fixed in place while the convoy maneuvered out of harm's way. More importantly, though, the U-boat was precluded from transmitting the position reports on which its pack mates depended to converge on the convoy.

In the latter stages of the war, the continued reliability of SIGINT, coupled with a surplus of escort vessels, led the Allies to deploy "support groups" of warships centered on a small aircraft carrier. The support groups (which later came to be known as "hunter-killer groups") operated in associated support of the close convoy escorts, exploiting both Ultra and HF/DF cues to localize and destroy U-boats before they came within striking range of a convoy. This doctrinal approach would be carried forward into the Cold War where it ultimately spurred the deployment of what is now called IUSS (Integrated

Undersea Surveillance System), which is composed of seabed sensors and towed sonar arrays that can detect nuclear submarines at long range, supplying cueing information to roving hunter–killer groups.

The success of the hunter-killer doctrine against noisy Soviet nuclear submarines in the 1960s and 1970s breathed new life into the very strategy that twice had led Britain to the brink of defeat: that is, protecting sea lanes rather than protecting convoys. This doctrinal transition was relatively easy considering that the materials needed for war in the Fulda gap were already in Europe and safeguarding sealift was a mission of lesser importance than defending the carrier battle groups. At the same time, the Soviets' huge fleet of diesel-electric submarines was dismissed as a purely "coastal" threat. For over 40 years, ASW doctrine and technological developments focused on hunting nuclear submarines in blue water. However, diesel-electric submarines operating on the battery, and even the latest generation of nuclear submarines, radiate very little acoustic energy that is exploitable by today's sonar systems, which were designed for the Cold War. Except under unusually quiet environmental conditions, long-range acoustic detection of modern submarines is a thing of the past, as is the idea of hunting state-of-the-art submarines in the open ocean.

A third lesson of World War II was that airpower contributed in large measure to the success of the ASW campaign. The chief effect of aircraft as part of the convoy escort was to force U-boats to submerge and thus keep them blind and immobile. But aircraft could also kill submarines they found on the surface and, under the right conditions, they could detect them submerged using the newly developed Magnetic Anomaly Detection (MAD) equipment. Aircraft were responsible for the destruction of 388 U-boats (nearly half of the total losses) and they assisted surface escort vessels in destroying an additional

45.[6] In spite of these obvious successes, there was much inter-service wrangling over how best to allocate "multi-mission" aircraft. The most effective maritime patrol aircraft of the war was the Consolidated B-24 Liberator, a long-range, four-engine bomber. The Army Air Force insisted that all available bomber aircraft should be employed in the strategic bombing campaign against German industries that, among other things, supported U-boat construction, whereas the Navy was clearly most concerned with finding and destroying those U-boats already at sea. The argument was never settled. In time, the point became moot when fully mobilized American industries were able to deliver enough airplanes to do both.

Allocation of multi-mission ships and aircraft continues to create problems for operational commanders. After the Cold War, today's P-3 Orion Maritime Patrol Aircraft took on several diverse roles ranging from strike to strategic and tactical intelligence collection, in addition to the ASW role for which it was built. The P-3 is still the most efficient hunter of conventional diesel-electric submarines in today's inventory. Like the U-boats, today's advanced diesel-electric submarines need to occasionally breathe. The key to catching them is to have an aircraft above the submarine's horizon around the clock, whenever and wherever the submarine tries to breathe, thus forcing the submarine's skipper to choose possible detection or certain suffocation. Once detected and forced down, the modern diesel-electric submarine is still handcuffed by its limited mobility and reduced sensor capability. Unfortunately, an effective hunt versus a modern, quiet submarine monopolizes a lot of multi-mission airplanes and crews. The lesson of World War II is clear: rather than hunt for submarines in the vastness of the ocean, employing Maritime Patrol Aircraft as close convoy escorts places scarce aircraft assets where the enemy submarines are most likely to be.

Since World War II, advances in diesel-electric submarines, weapons, and sensors have accomplished surprisingly little in swaying the technological advantage in an ASW campaign. However, the importance of the objective for the defender has increased significantly: that is, to safeguard the nation's small sealift/merchant fleet. With fewer forces deployed overseas, the United States has become more dependent than ever on sealift as a crucial element of power projection.

It follows that today's smaller numbers of extremely large merchant ships and their immense cargoes of war materials are individually more valuable than was the case in World War II. To put this in perspective, the standard wartime cargo ship was the mass-produced "Liberty Ship" of 10,000 tons. By the end of the war, American industry had delivered more than 2700 Liberty Ships at an average price of $2,000,000 each, achieving a peak production rate of 140 ships per month.[7] By comparison, one of today's Algol-class Fast Sealift Ships of 56,000 (displacement) tons carries fully one-eighth of the vehicles and material needed to field an Army mechanized division, a cargo that is comparable, in terms of tonnage alone, to that carried by seven World War II Liberty ships. However, the basic equation hasn't changed, at least from the submarine skipper's point of view: one well-placed torpedo will still sink one merchant ship. Further tipping the scales in favor of the submarine is the notion that, compared to a Liberty Ship, today's highly automated merchant ships with their small crews are less capable of coping with battle damage, therefore they might not survive even a poorly placed hit. However, the fact remains that the submarine still needs to get close enough to its victim to deliver the mortal blow.

Unlike today, World War II merchant ships and their cargoes were expendable. American war industries bought time for the ASW forces to defeat the U-boats by mass-producing ships (and war material to fill them) faster than the U-boats could sink them.

After 1945, however, the steady decline in the American shipbuilding industrial base, coupled with our dwindling pool of experienced mariners has rendered a repeat performance unlikely, if not impossible. We will fight the next war with the small Military Sealift Command fleet augmented by 200 or so U.S.- flagged ships and whatever shipping we can charter from foreign owners in time of crisis. Furthermore, the ships' cargoes of high tech weapons will be similarly difficult to replace in quantity without limited mobilization and reopening of closed production lines.

The trend in ocean commerce since World War II has been toward shipping more material in fewer, more efficient vessels. The quest for efficiency has led to ever faster and larger ships. Some would even say that today's fast merchant ships have eliminated the need for convoys. It is true that faster ships certainly increased the challenge and reduced the margin for error for a submarine commander trying to maneuver into firing position. During World War II extremely fast troop ships, such as the liners Queen Mary and Queen Elizabeth, were routed independently, away from convoy lanes. Realizing that escorting warships would quickly exhaust their fuel simply trying to keep pace with the much larger liners, particularly in heavy weather (a key planning consideration for fast convoys today), the Allies counted on the liners' great speed as their only defense against U-boats that were hopefully preoccupied with convoys. Both Queens survived the war without a scratch.

Advances in submarine weapons technology continue to erode the advantage held by the fast merchant ship over the diesel-electric submarine by greatly increasing the range envelope for a successful attack. Some weapons, wake homing torpedoes for example, can even be delivered from over the horizon. Furthermore, today's diesel-electric submarines are capable of brief underwater sprints at 20 knots or more, if needed, to attain the preferred firing position. Finally, information technology enables a submarine to access

satellite imagery, sailing schedules, cargo manifests, and high-quality photos of the targets of interest that will allow the submarine skipper to autonomously choose the target, choose the battleground, and then lie in ambush. After the engagement, the skipper might even download color images of the smoking wreck from the CNN website and paste them into his patrol report.

Few weapons systems can generate the worldwide shock effect of a submarine torpedo attack. Both World Wars showed that a submarine threat can create chaos in the shipping industry. Such chaos would have far-reaching effects in a global economy that is founded on "just-in-time production." With that in mind, history also shows that an enemy might choose not to wait until the conflict starts to strike the first blow. It is now common knowledge among our enemies that much of the war material needed for the United States to project power is at sea right now in vulnerable, easily identifiable ships. These ships are often anchored in harbors and open roadsteads in remote corners of the globe, where they sit, like staked goats, waiting for a pre-emptive attack. Moreover, pre-hostilities movement of the pre-positioning ships to areas of imminent conflict is one of a long list of potential "Flexible Deterrent Options." Such a move might deliver these vulnerable ships right into the sights of the enemy's submarines. In any event, sinking just one of these ships would constitute, not only a severe blow to our national prestige, but also a setback to our power projection timetable.

In spite of these seemingly overwhelming advantages for the submarine, what of the defenders? The answer hasn't changed since World War I. For a number of reasons, convoys with both air and surface escorts continue to provide not only the best security for merchant vessels, but also a means of forcing engagements with submarines.

First, as was the case in World War II, the mere presence of escorts compels a diesel submarine skipper to alter his tactics or accept greater risk. For example, in attacking an escorted convoy (as opposed to attacking undefended merchant ships), the submarine skipper must reserve a large fraction of the available energy reserve in the battery for his escape, which places a constraint on the total energy available for dodging the escorting warships and aircraft to get at the convoy. The presence of warships also places constraints on the submarine's underwater speed if it is to avoid acoustic detection.

Second, despite the increased range of submarine weapons, it is unlikely today that the submarine commander will be empowered by rules of engagement to shoot without first identifying his target. He will therefore need to approach the convoy to somehow positively identify his target (periscope sighting is most likely), offering an opportunity for the convoy escorts to detect and engage the submarine. If the submarine can be localized and forced down by the escorts, today's faster convoys are much more capable of sidestepping the submarine than was the case in World War II.

Finally, the threat submarine will likely be one of a handful of submarines, at most, possessed by the aggressor nation. There will likely be more convoy escorts than there are enemy submarines. The submarine skipper's risk-versus-gain calculation will no doubt be affected by the realization that he is driving a national treasure.

Given that the convoy system is the surest means of defeating the submarine threat, implementing a convoy system today would present a serious challenge for military logisticians. The numbers of vehicles, equipment, people, beans, and bullets that must be quickly assembled at a remote forward location in order for the United States to conduct combat operations is staggering. The capacity of host nation port facilities to accept and unload today's outsized sealift ships is the biggest potential bottleneck in the process.

The cargo ships of WWII could offload at relatively austere port facilities, or, in the absence of a pier, they were sometimes simply beached while they offloaded. Nearly all ships of that era were self-unloading (tankers or break-bulk freighters), they were smaller (300-500 feet in length) than today's cargo ships, they were relatively shallow-draft (18-20feet), and they could be maneuvered, in a pinch, without the assistance of tugs. England, with its myriad of harbors and inlets, was not only perfectly positioned to be the eastern terminus of the convoy system, but it was also the perfect base of operations for the invasion of Europe.

Since World War II, cargo-handling equipment has been progressively eliminated from commercial ships in order to devote space and tonnage capacity to containerized cargo. Today's ships are dependent on deep-water ports with piers that are fitted with specialized cargo-handling equipment. Although the purpose-built sealift ships have been fitted with some cargo cranes for a limited "stream offload capability," they are only at their best when employed as "roll-on/roll-off" ships. As cargo is discharged, pierside material staging areas rapidly become choked as the vehicles and material are prepared for onward movement. There might be only one pier in an area of conflict that can berth and offload a 900-foot-long, 36-foot-draft Fast Sealift Ship or Large, Medium-Speed Roll-On, Roll-Off ship. Faced with this constraint, logisticians would like ships to arrive singly, at regular intervals, in order to preclude backlogs and thereby maximize efficiency.

Convoys, then, are the antithesis of efficiency, at least from the standpoint of the logistician. Convoys exacerbate port loading problems by forcing simultaneous arrivals by too many ships at too few piers. In the absence of protected anchorages, the ships become vulnerable to attack as they wait to be offloaded. Furthermore, as the Allies soon

discovered at the outset of World War II, the number of warships that can be pressed into service as convoy escorts governs the 'throughput' of a convoy system.

Not unlike the pre-war battleship Navy, today's Navy is a fleet of capital ships that is heavily weighted with cruisers and cruiser-sized destroyers. Only a handful of the Cold War frigates of the Garcia-, Knox-, and Oliver Hazard Perry-classes remain in commission. Unlike today's multi-mission warships, these "low-mix" frigates were purpose-built ocean escorts. The AEGIS cruisers and destroyers will be in demand for a variety of missions ranging from theater ballistic missile defense to Maritime Interception operations to strike. Given the expected stiff competition for assets, the theater CINC must be prepared to leverage the capabilities of Allied/Coalition navies in order to win an ASW campaign. During World War II, British, U.S., Polish, Canadian, and Free French ships and aircraft fought side-by-side in the Battle of the Atlantic. However, the complexity of modern ASW requires attention to such details as interoperability standards, C^4I compatibility, and intelligence sharing arrangements if we are to similarly integrate capable Allied navies into ASW escort groups in times of crisis.

Merchant ship convoys raise considerable concern from the standpoint of operational risk management. Sailing a group of large, extremely valuable ships with dissimilar maneuvering characteristics at high speed in close proximity to one another requires acceptance of some risk. High-speed convoy of multiple merchant vessels is a feat of seamanship that is rarely, if ever, practiced in peacetime, partly because the margin for human error and/or mechanical failure is so small. During World War II, when convoys moving at 10 knots were considered to be "high-speed," collisions were common, particularly at night, in reduced visibility, or during the confusion that resulted from a submarine attack. Collisions were usually not fatal at such low speeds and thus the risk of

collision was accepted rather than increasing the spacing between ships to provide more of a safety margin, a solution that was expected to incur far greater risk of ship losses since it lengthened the perimeter that had to be defended by the escorts. Today, however, a collision between two 50,000-ton ships operating at 20 knots or more, if not fatal, is likely to be crippling to one or both, creating a problem for the convoy escorts to cover both the convoy and the cripples as they limp away to safe harbor, not to mention the problems created for the logisticians who are waiting for the cargo.

There is a tendency to point to Desert Storm as the blueprint for all future sealift operations. While Desert Storm was an unquestioned logistical success, we must not overlook the fact that there was no threat to the U.S. and foreign flag merchant ships supplying the war effort as they sailed independently over the 8500-mile Sea Lines of Communication (SLOCs) between the U.S. east coast and Saudi Arabia, passing through a number of chokepoints along the way that would make a submarine skipper's mouth water. Furthermore, the Saudis provided two deep-draft seaports with state-of-the-art pier facilities capable of accommodating multiple ships and with vast staging areas to swallow the huge amount of material that was delivered by sea. It is at least reasonable to suggest that these conditions might not recur in future conflicts. With both the lessons of World War II and the challenges of modern logistics firmly in mind, I offer the following recommendations.

First, all U.S. warships that might be tasked as convoy escort vessels should be capable of receiving and handling all-source SIGINT data and IUSS information. As was proven in World War II, real-time SIGINT information provides a crucial advantage in an ASW campaign. However, SIGINT is perishable and time lost in third party processing, downgrading, and relay to a convoy escort commander can render the information useless.

Second, shiphandling in convoy is a set of skills that requires practice, by Military Sealift Command officers and naval officers as well. Ship's bridge simulation software should be the initial test bed for identifying and developing critical skills as well as for refining convoy techniques and procedures, such as establishing maximum safe speeds of advance, optimizing ship intervals, and developing formation maneuvers for use in case of air attack, submarine attack, etc. These techniques should be simulated using all of the current MPS/APS ships and DD/DDG/CG maneuvering characteristics as a minimum. Simulations should include conditions of reduced visibility, heavy weather, EMCON (radar silent), and coping with critical equipment failures. Once crews are certified in the simulator, convoy procedures should be practiced at every opportunity, with as many ships as possible. These procedures might be practiced during scheduled sealift ship mobilization exercises in CONUS, or during exercises involving deployed naval units and overseas Maritime Pre-Positioning Squadrons. Shipboard desktop computer simulation might be considered as another means of sustaining watch team proficiency.

Third, ships and aircraft squadrons cannot be readily rotated into a convoy escort role from other, non-ASW tasking. Anti-Submarine Warfare encompasses one of the most difficult skill sets for a ship or aircrew to master and also one of the most perishable. Not surprisingly, the World War II experience revealed that the lowest merchant vessel loss rate was achieved when escorts were assigned to semi-permanent task groups that worked up and fought together. Furthermore, ASW was and still is a manpower-intensive, around-the-clock battle. Fatigue and boredom will quickly impact the effectiveness of crews subjected to continuous convoy duty, particularly during prolonged periods of heavy weather. It follows that enough escort groups must be fielded to allow for rest between convoy runs. Even when escorts were in short supply, a typical World War II escort group

could expect two days pierside between each 10-day convoy, a time for convoy briefings, mission-critical ship repairs, and, with any luck, some crew rest.

Finally, operational planning must take into account potential threats to sealift and the Time Phased Force Deployment Data (TPFDD) must incorporate the necessary ship delays resulting from those threats. For example, such variables as diversion to convoy assembly area, assembly/briefing time, convoy transit time at a reasonably safe speed of advance, and escort recycle time must be considered when calculating force closure times. Outbound convoys to protect ships returning in ballast should be similarly planned. Moreover, the port congestion resulting from the convoy system needs to be considered when determining convoy size.

Just as the Allies ability to defend their sealift ultimately decided the outcome of World War II, the United States' preparedness to protect its sealift might determine the final score of the next campaign. The critical importance of defending sealift is best summed up in the words of Winston Churchill:

> The Battle of the Atlantic was the dominating factor all through the war. Never for one moment could we forget that everything happening elsewhere, on land, at sea, or in the air depended ultimately on its outcome, and amid all other cares we viewed its changing fortunes by day with hope or apprehension.[8]

However, in sharp contrast to the Allies situation in 1940-42, today's limited reserve of sealift ships and the lack of the industrial base needed to quickly replace them leaves operational commanders with little or no room to accept ship losses resulting from either doctrinal growing pains or overly-optimistic assessments of the enemy's capabilities and/or his intentions.

Source notes:

1. Snyder and Smith, p.21.

2. Tarrant p.66.
3. Tarrant p. 67
4. Tarrant p.67-68
5. Tarrant p. 146
6. Kaplan and Currie p.68
7. Gannon p.xvii

BIBLIOGRAPHY

Vego, Milan N. Operational Warfare (Newport, U.S. Naval War College, 2001).

Mahan, A.T. The Influence of Sea Power Upon History 1660-1783 (Mineola, NY: Dover, 1987).

Edwards, Bernard. Donitz and the Wolf Packs, The U-boats at War (London: Cassell, 1996).

High Command of the German Navy. The U-Boat Commander's Handbook (Gettysburg, PA: Thomas Publications, 1989).

Hughes, Costello. The Battle of the Atlantic (New York: Dial Press, 1977).

Farago, Ladislas. The Tenth Fleet (New York, Ivan Obolensky Inc., 1962).

Gannon, Michael. Black May (New York, HarperCollins, 1998).

Hickam, Homer Jr. Torpedo Junction, The U-boat War off America's East Coast, 1942 (New York: Dell Publishing, 1989).

Waters, John Jr. Bloody Winter (Annapolis, MD: U.S. Naval Institute Press, 1994).

Miller, David. U-Boats, The Illustrated History of the Raiders of the Deep (London: Pegasus Publishing, 2000)

Sharpe, Peter. U-Boat Fact File1935-1945 (Leicester, UK: Midland Publishing Ltd., 1998).

Kaplan, Philip and Currie, Jack. Convoy, Merchant Sailors at War, 1939-1945 (Annapolis, MD: U.S. Naval Institute Press, 2000).

Snyder, Thomas and Smith, Stella. The War in the Persian Gulf, *Air Force Journal of Logistics,* Volume XXII, Number 2, pp.16-28.

Joint Chiefs of Staff, Doctrine for Logistics Support of Joint Operations (Joint Publication 4-0, (Washington, D.C., Joint Chiefs of Staff, 2000).